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(54) Chip component supply equipment.

(57) The chip component supply equipment of the invention comprises:

a container box 2 for storing chip components 1 in pieces,

means for conveying chip components 1 from the container box 2 onto a conveyor belt 7,

a conveyor belt 7 moving intermittently for conveying the transferred chip components 1 toward a take-out port where a vacuum suction nozzle 15 of an electronic component placement machine takes out chip components, and

a stopper 12 positioned at the take-out port for stopping the chip components 1 conveyed by the conveyor belt 7 at the take-out port,

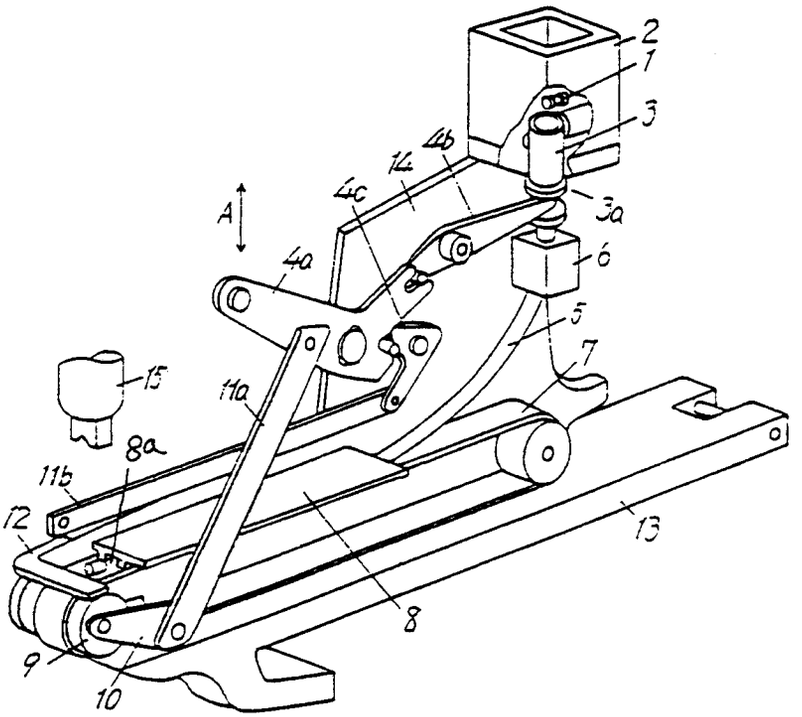
wherein the stopper 12 moves and departs from the take-out port when the conveyor belt 7 finishes intermittent motion and stops, and returns and is positioned at the take-out port before the next chip component 1 conveyed by next intermittent motion of the conveyor belt 7 reaches the take-out port.

The vacuum suction nozzle of the electronic component placement machine takes out the chip component at the take-out port when the conveyor belt is stopped and the stopper is apart from the take-out port.

Since the conveyor belt 7 is stopped, the chip component at the take-out port is not pushed by the succeeding chip component or is not moved by the vibration of the conveyor belt 7. This facilitates the work of the vacuum suction nozzle to take out the chip component. Furthermore, since the stopper is apart from the take-out part, there is no risk of interference of the vacuum suction nozzle and the chip component to be taken out with the stopper, and irregular chip components will not cause jamming in the take-out port. The benefits also contribute to the ease of work of the vacuum suction nozzle to take out the chip components.

EP 0 601 603 A1

Fig. 1



BACKGROUND OF THE INVENTION

The present invention relates to a chip component supply equipment used in an electronic component placement machine for mounting chip electronic components (hereinafter called chip components) on a circuit board.

The chip component supply equipment is used in order that chip components supplied in pieces as shown in Fig. 6 (a) to (d) may be sent successively into the electronic component placement machine, as being positioned at specified places in specified posture, so as to be taken out by a vacuum suction nozzle. A conventional chip component supply equipment is shown in Fig. 7.

In Fig. 7, chip components 1 are stored in pieces in a hopper 28, and a fixed pipe 27 is slidably inserted in the bottom of the hopper 28. The hopper 28 is driven vertically by oscillating means not shown in the drawing, and the chip components 1 drop into the pipe 27. The dropped chip components reach a feeder 24 through a coupled flexible pipe 26, and are driven by the feeder 24 to be carried up to a take-out port 25. The chip components are successively taken out by a vacuum suction nozzle 29 of an electronic component placement machine (not shown) at the take-out port 25, and are mounted on a circuit board. In such conventional chip component supply equipment, however, chip components may pop out of the equipment or be positioned irregularly due to vibrations of the equipment. Or, the succeeding chip components driven by the feeder 24 may push the chip components staying at the take-out port 25 with a very strong pressure, and the vacuum suction nozzle 29 may fail to take them out occasionally. Yet, irregular chip components broken by some accident may cause jamming in the take-out port 25, and the operation of the electronic component placement machine may be stopped.

The invention presents a chip component supply equipment of a novel constitution eliminating the possibility of such troubles.

SUMMARY OF THE INVENTION

The chip component supply equipment of the invention comprises:

a container box for storing chip components in pieces,

means for conveying chip components from the container box onto a conveyor belt,

a conveyor belt moving intermittently for conveying the transferred chip components toward a take-out port where a vacuum suction nozzle of an electronic component placement machine takes out chip components, and

a stopper positioned at the take-out port for stopping the chip components conveyed by the conveyor belt at the take-out port,

wherein the stopper moves and departs from the take-out port when the conveyor belt finishes intermittent motion and stops, and returns and is positioned at the take-out port before the next chip component conveyed by next intermittent motion of the conveyor belt reaches the take-out port.

The vacuum suction nozzle of the electronic component placement machine takes out the chip component at the take-out port when the conveyor belt is stopped and the stopper is apart from the take-out port.

Since the conveyor belt 7 is stopped, the chip component at the take-out port is not pushed by the succeeding chip component or is not moved by the vibration of the conveyor belt 7. This facilitates the work of the vacuum suction nozzle to take out the chip component. Furthermore, since the stopper is apart from the take-out part, there is no risk of interference of the vacuum suction nozzle and the chip component to be taken out with the stopper, and irregular chip components will not cause jamming in the take-out port. The benefits also contribute to the ease of work of the vacuum suction nozzle to take out the chip components.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing an embodiment of chip component supply equipment of the invention.

Fig. 2 is a sectional view of a conveyor belt included in the embodiment of chip component supply equipment of the invention.

Fig. 3 is a diagram explaining the action of a stopper included in the embodiment of chip component supply equipment of the invention.

Fig. 4 is a diagram showing the motion of one cycle of chip component supply equipment of the invention.

Fig. 5 (a), (b) are sectional views of a container box and a take-out pipe included in the embodiment of chip component supply equipment of the invention.

Fig. 6 is a perspective view of several types of chip components.

Fig. 7 is a conventional chip component supply equipment.

DETAILED DESCRIPTION OF THE INVENTION

In Fig. 1, a container box 2 stores a lot of chip components 1 in pieces. A hollow movable pipe 3 is coupled slidably to the bottom of the container box 2. Arrow A indicates the vertical motion of a lever 4a.

An electronic component placement machine (not shown) comprises plural sets of chip component supply equipment storing different types of chip components, and the lever 4a of the chip component supply equipment containing the chip components to be mounted is vertically driven by an actuator (not shown) of the electronic component placement machine selectively, and the chip component conveyed to the take-out port is taken out by a vacuum suction nozzle 15, and is mounted on a circuit board.

The motion of the lever 4a is transmitted to a neck portion 3a lowered in the lower part of the movable pipe 3 through a lever 4b, and drives the movable pipe 3 vertically inside the container box 2.

By this motion, the chip components 1 stored in the container box 2 are successively dropped into the movable pipe 3, and the dropped chip components pass through the movable pipe 3 and a conveying tube 5 extended downward as being coupled to the movable pipe 3, and are discharged to the terminal end of the conveying tube 5. The conveying tube 5 is fixed to a side wall 14 by a holder 6.

The terminal end of the conveying tube 5 is inserted into a guide groove 8a of a guide cover 8 mounted on a conveyor belt 7. The chip components 1 discharged from the terminal end of the conveying tube 5 are aligned in the guide groove 8a, and conveyed toward the take-out port where the vacuum suction nozzle 15 of the electronic component placement machine takes out the chip components, near the left end of the conveyor belt 7, by the conveyor belt 7 which moves intermittently.

The motion from the top dead center to the bottom dead center of the lever 4a does not move a ratchet wheel 9, but the motion from the bottom dead center to the top dead center rotates the ratchet wheel 9 by a specific angle, through a linkage piece 11a and a ratchet 10. That is, the conveyor belt 7 moves intermittently in the direction of arrow B in Fig. 2 by one vertical stroke of the lever 4a. The moving distance by one intermittent motion of the conveyor belt 7 is set longer than the length of the chip components 1 to be conveyed.

One cycle of motion of the conveyor belt 7, stopper 12, and vacuum suction nozzle 15 are summarized as follows. This is shown in Fig. 4.

(1) The chip components 1 moving together with the conveyor belt 7 on the intermittently moving conveyor belt 7 are prevented from moving together with the conveyor belt 7 by the stopper 12 located at the take-out port, and stopped. Between the stopped chip components 1 and the conveyor belt 7, slipping occurs from the end of intermittent motion until stopping of the conveyor belt 7.

(2) When the conveyor belt 7 stops, as shown in Fig. 3, the stopper 12 moves in the direction of arrow C, and departs from the chip components stopped at the take-out port.

(3) The vacuum suction nozzle 15 descends, and sucks the chip component 1, and then ascends.

(4) The conveyor belt conveys the next chip component toward the take-out port.

(5) The stopper 12 returns toward the take-out port so as to be located at the take-out port before the next chip component reaches the take-out port.

These steps are the motion of one cycle of the chip component supply equipment. By repeating the motion of this one cycle, chip components are taken out successively.

In this way, the vacuum suction nozzle of the electronic component placement machine takes out the chip at the take-out port while the conveyor belt is stopped and the stopper is apart from the take-out port.

Since the conveyor belt 7 is stopped, the chip component at the take-out port will not be pushed by the succeeding chip component, or not be moved by the vibration of the conveyor belt 7. This facilitates the work of the vacuum suction nozzle to take out the chip component. Moreover, since the stopper is apart from the take-out portion, there is no risk of interference of the vacuum suction nozzle and the chip component to be taken out with the stopper, and irregular chip components will not cause jamming in the take-out port. All these benefits make it easier for the vacuum suction nozzle to take out the chip components.

In the foregoing embodiment, the vertical motion of the movable pipe 3 in the container box 2, the intermittent motion of the conveyor belt 7, and the motion of the stopper are all created by the power of the actuator of the electronic component placement machine for moving the lever 4a vertically. The invention is, however, not limited to this embodiment only. For example, the movable pipe 3, conveyor belt 7, and stopper 12 may comprise known driving sources such as motor or solenoid, and these driving sources cooperate to produce the same motions as in the embodiment, thereby realizing the invention.

Fig. 5 shows the movable pipe 3 making vertical motions in the container box 2 storing multiple chip components 1 in pieces. The movable pipe 3 is slidably coupled with the container box 2 and conveying tube 5, and is driven by the lever 4b to make vertical motions, and thereby the chip components 1 drop inside, and the dropped chip components 1 are conveyed onto the conveyor belt 7

through the movable pipe 3 and conveying tube 5.

In one cycle of vertical motion of the movable pipe 3, the movable pipe 3 initially at the upper end of the motion as shown in Fig. 5 (a) goes to the lower end as shown in Fig. 5 (b), and immediately returns to the upper end. Thus, as compared with its reverse motion, that is, the movable pipe 3 initially at the lower end of the motion going to the upper end and returning to the lower end, the number of chip components 1 falling into the movable pipe 3 is increased, so that the chip components 1 may be supplied more securely.

A slope 2a inside the container box 2 makes it easier to concentrate the chip components in one position.

Claims

1. A chip component supply equipment comprising:

a container box for storing chip components in pieces,

means for conveying chip components from the container box onto a conveyor belt,

a conveyor belt moving intermittently for conveying the transferred chip components toward a take-out port where a vacuum suction nozzle of an electronic component placement machine takes out chip components, and

a stopper positioned at the take-out port for stopping the chip components conveyed by the conveyor belt at the take-out port,

wherein the stopper moves and departs from the take-out port when the conveyor belt finishes intermittent motion and stops, and returns and is positioned at the take-out port before the next chip component conveyed by next intermittent motion of the conveyor belt reaches the take-out port.

2. A chip component supply equipment according to claim 1, wherein the means for conveying chip components from the container box onto the conveyor belt comprises:

a movable pipe slidably coupled to the bottom of the container box at one end, being driven so that the same end may be moved up and down intermittently in the container box, and

a conveying tube coupled to the movable pipe and extended downward.

3. A chip component supply equipment according to claim 2, wherein the movable pipe intermittently repeats motions of one cycle moving vertically, and the motion of one cycle comprises:

(1) The movable pipe initially at the upper end of motion, and

(2) The movable pipe going to the lower end of motion, then returning to the upper end immediately.

4. A chip component supply equipment according to claim 1, wherein the moving distance by one intermittent motion of the conveyor belt is longer than the length of the chip components to be conveyed.

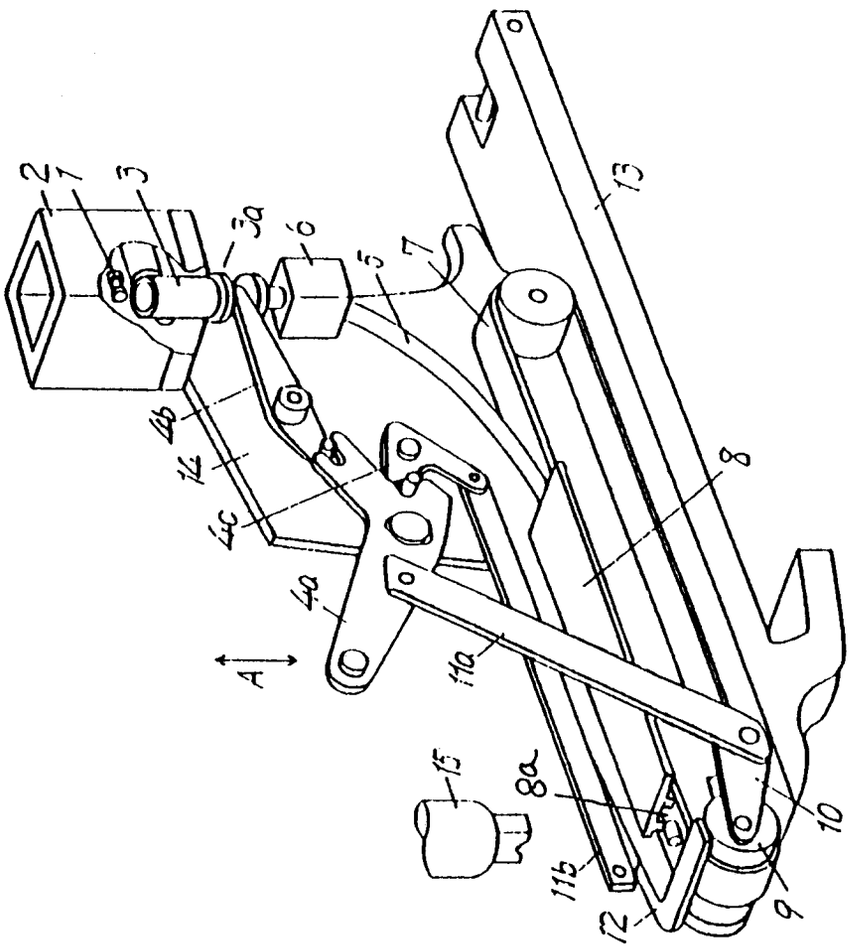


Fig. 1

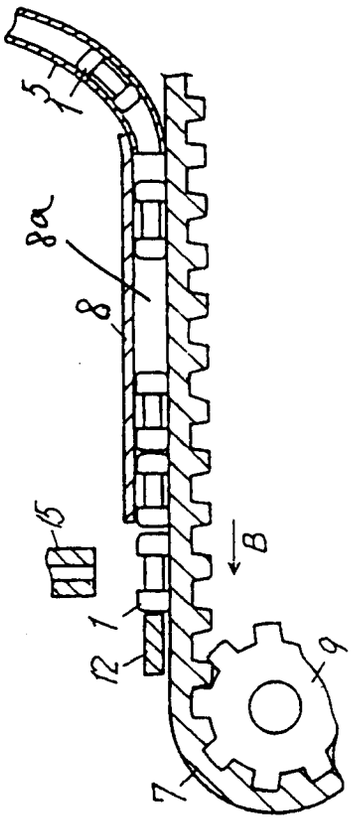


Fig. 2

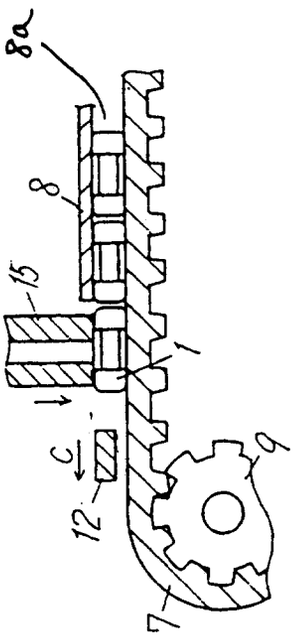


Fig. 3

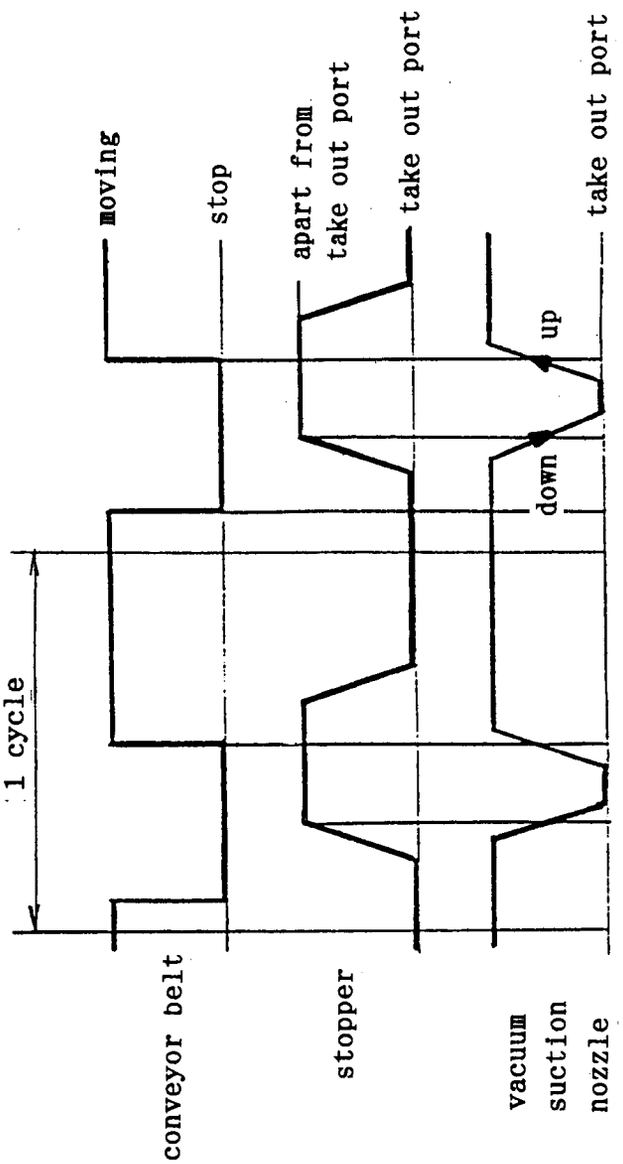

1 cycle
conveyor belt
moving
stop
stopper
apart from
take out port
take out port
down
up
vacuum
suction
nozzle
take out port

Fig. 4

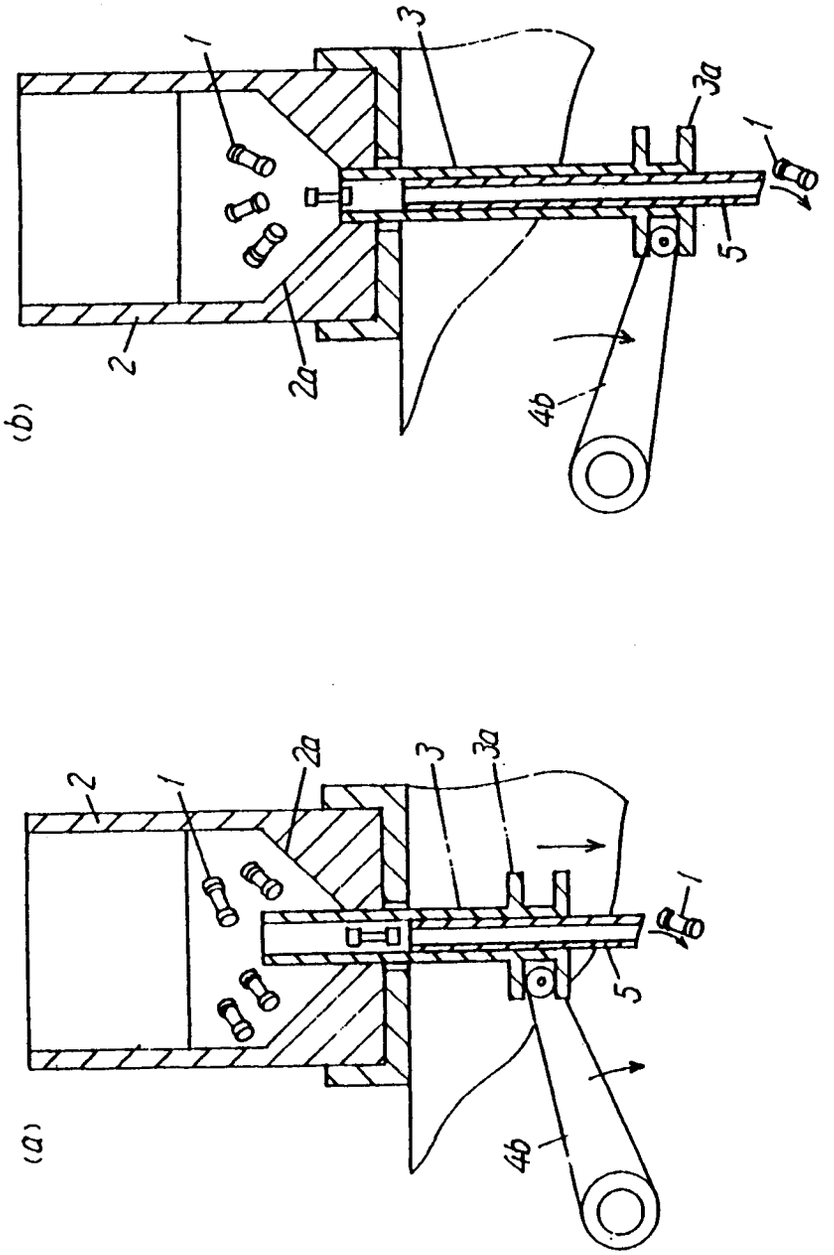


Fig. 5

Fig. 6

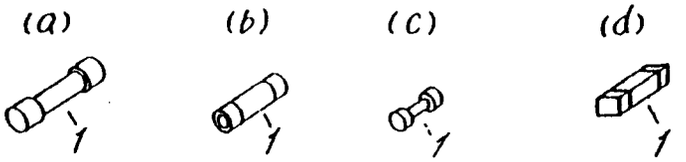
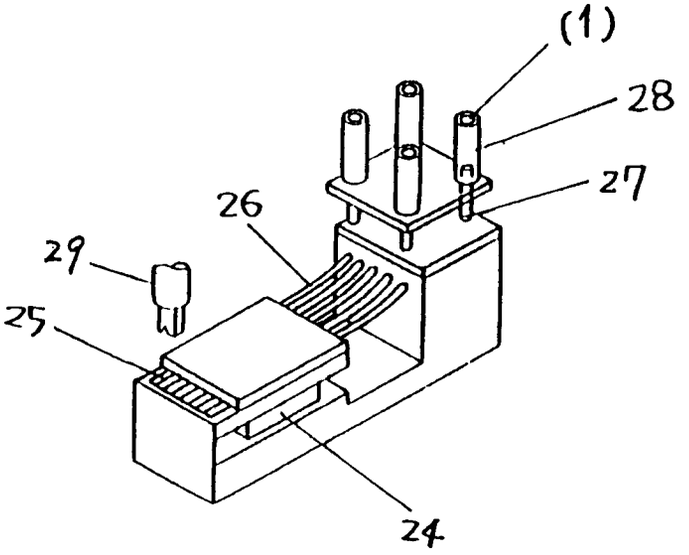


Fig. 7



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 11 9983

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	GB-A-2 244 482 (TALYO YUDEN CO) 4 December 1991 * page 1, last paragraph * * page 6-10; figure 1 *	1	H05K13/02
A	* figures 7,10,24 *	2-4	
X	US-A-4 459 743 (WATANABE) * the whole document *	1	
A		2-4	
A	EP-A-0 301 691 (EMHART INDUSTRIES INC) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

H05K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 February 1994	Bertin, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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